

REMARKS

The outstanding Office Action includes a rejection of claims 1, 3, and 12 under 35 U.S.C. § 112, second paragraph. In view of the amendment to claims 1, 4, and 12, it is submitted that the grounds for this rejection have been rendered moot. Accordingly, withdrawal of this rejection is requested.

The outstanding Office Action includes a single prior art-based rejection. Claims 1, 2, 4, 7, 8, 10-13, 15, 16, and 18-20 stand rejected under 35 U.S.C. §103(a) over DE 38190202 to Jaervinen, U.S. Patent No. 4,917,775 to Rantapuska et al., the Examiner's reference to "admitted prior art," and U.S. Patent No. 6,606,901 to Haanstra et al. This rejection is traversed.

The claimed invention is directed at a method and an apparatus for controlling a continuous cobalt removal in conjunction with a zinc preparation process, in which the cobalt removal is performed in at least two reactors comprising a first reactor and a second reactor connected in series with a connecting pipe between the first reactor and the second reactor, and an outlet pipe from the second reactor. In conjunction with the two reactors, the redox potential and the acidity and/or basicity are measured, and the process variables of the cobalt removal are adjusted toward a desired direction based on the measurement results, wherein the measurements of the redox potential are performed from the sludge produced in the reactors in the connecting pipe between the first reactor and the second and in the outlet pipe from the second reactor, and the acidity and/or basicity of the reactor solution is determined by means of a BT value. The measuring instruments of the redox potential are purified at predetermined intervals, and based on the measurement results, introduction of zinc powder into the cobalt removal reactors is adjusted to provide a BT value of about 1.0 to 3.0.

The prior art relied upon in the outstanding Office Action fail to disclose or suggest providing redox potential measuring instruments in a connecting pipe between a first reactor and a second reactor and in an outlet pipe from the second reactor, and fail to describe or suggest introducing zinc powder into the cobalt removal reactors to provide a BT value of about 1.0 to 3.0 according to the presently claimed invention. The Applicants discovered that by providing redox potential measuring instruments in the connecting pipe and in the outlet pipe, the redox potential measuring instruments can be more easily and more consistently cleaned. As a result,

the Applicants are able to improve the efficiency of their process compared with the prior art. The Examiner's attention is directed to the above-identified patent application at, for example, page 1, line 30 through page 2, line 20. Furthermore, introducing zinc powder and maintaining the BT value to about 1.0 to 3.0 helps maintain the efficiency of the cobalt removal process. None of the cited prior art references disclose the combination of including measurement of the redox potential outside the reactive vessels and the determining the BT value from the reactor solution and providing a BT value of about 1.0 to 3.0.

Jaervinen discloses a method for adjusting the amount of zinc powder to be used in the removal of impurities from a zinc sulphate solution. According to Jaervinen, impurities are removed from a zinc sulphate solution by means of electrolytic purification of zinc and, particularly, to the adjustment of the amount of a zinc powder to be used in the removal of impurities. The removal of impurities such as copper, cobalt, nickel, germanium, and cadmium is performed by cementing them with zinc powder. To utilize the correct amount of zinc powder, redox potential measurement is used. The removal of impurities is carried out at three stages. The second stage is the removal of cobalt and it is carried out preferably as a batch process. The removal of cobalt by means of zinc powder is made only in one reactor and the redox potential measurement is carried out inside the reactor.

In the present invention, the use of the BT (Back titration) value for determining the acidity and/or basicity of the reactor solution was completely new technology at the time of the invention. The use of the BT value would not have been obvious to a person skilled in the art at the time of the invention. In the present invention, the acidity and/or basicity of the reactor solution is determined by means of the BT value. Due to the BT value, the real acidity and/or basicity of the solution is known. The BT value describes the status of a process more accurately than the pH value and the BT value enables one to perform accurate determinations to evaluate the status of the process. Then acidity and/or basicity of the solution can be adjusted more accurately towards the desired direction.

Rantapuska et al. disclose a method for measuring electrochemical potential by at least one mineral electrode. The mineral electrode is cleaned by switching onto the electrode a supply voltage differing from the electrochemical balance potential of the electrode. Supply voltage is

switched off before starting the measuring operation. In the description of Rantapuska et al., it is not disclosed that the measuring of the electrochemical potential and/or the cleaning of the electrode is carried out in a connecting pipe between two reactors or in an outlet pipe of a reactor. In Figure 2 of Rantapuska et al., there is illustrated only a measuring cell 12, because it is easier and clearer to illustrate the measuring cell separately without a reactor than in connection with the reactor. In fact the measuring cell has been arranged in the reactor vessel. In Figure 3 of Rantapuska et al., there is illustrated only processing of the data received by the measuring cell.

Rantapuska et al. describe a method for measuring and adjusting electrochemical potential and/or component content in the process of treating valuable materials. See Rantapuska et al. at column 1, lines 9-15. It is submitted that Rantapuska et al. fail to suggest measuring redox potential in a connecting pipe between two reactors or in an outlet pipe.

Haanstra et al. disclose a process for determining the acidity of a washing solution for removing adhering acid or base from a fibre.

The outstanding Office Action refers to an admission by the Applicants in the context of the above-identified patent application at page 2, lines 7-12. See the outstanding Office Action at page 5. This location in the above-identified patent application refers to known ways to optimize metal removal. It is known to measure the redox potential and the pH values of a metal removal mixture inside a precipitation reactor. The Applicants, however, discovered that the redox potential can be measured in a connecting pipe between a first reactor and a second reactor and in an outlet pipe of the second reactor. This is not disclosed or suggested by the prior art. Furthermore, the Applicants discovered that by measuring the redox potential in the connecting pipe and in the outlet pipe, the efficiency of the process can be improved. The redox potential measurement electrodes can be more easily cleaned as a result of their removal for the reactors. As a result, control of the process can be improved. Clearly, the present invention is an improvement over the techniques reported in the specification at page 2, lines 7-12.

In view of the above comments, one having ordinary skill in the art would not have received a suggestion from the prior art relied upon in the outstanding Office Action to measure the redox potential outside of the reactor vessels, and to determine the BT value from reactor

solution and adjust the introduction of zinc powder to provide a BT value of about 1.0 to 3.0 according to the presently claimed invention.

In view of the above comments, the claimed invention would not have been obvious over Jaervinen, Rantapuska et al., the Examiner's reference to "admitted prior art," and Haanstra et al. Accordingly, withdrawal of this rejection is requested.

It is believed that this application is in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

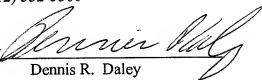
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